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Question Paper Code: U5503

M.E. DEGREE EXAMINATION, APRIL / MAY 2025

Elective

Power Electronics and Drives

21PPE503- CONTROL OF SPECIAL ELECTRICAL MACHINES

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART – A (5 x 20 = 100 Marks)

1. (a) Describe the working principle of a stepping motor. CO1- U (20)
How does it achieve discrete angular movements?
Or
(b) Explain how torque is produced in a Variable Reluctance CO1 - U (20)
stepping motor. Use the concept of reluctance and magnetic flux
paths.
2. (a) What are the torque-speed characteristics of a Permanent Magnet CO1 - U (20)
Synchronous Motor (PMSM)?
Or
(b) Compare the magnetic flux path in axial vs. radial air gap motors CO1 - U (20)
and its effect on performance.
3. (a) Microprocessors are widely used in modern SRM drives. CO3 -Ana (20)
Evaluate how their integration enhances the control system's
responsiveness and flexibility.
Or
(b) Assess the impact of hysteresis current control on torque ripple CO3 -Ana (20)
and switching frequency. Under what operating conditions might
it become less efficient?
4. (a) Develop a basic control algorithm for speed regulation in a CO4 -Ana (20)
BLDC motor used in an electric vehicle. Discuss sensor
feedback and pulse-width modulation.

Or

- (b) Examine how detent torque and cogging torque arise in PMBLDC motors. What strategies can minimize their effects in precision applications? CO4 -Ana (20)
5. (a) Create a control strategy that maintains stable operation of a linear motor under varying load conditions and ambient temperature. CO5 - App (20)
- Or
- (b) Suggest a linear motor type (LIM, LSM, or DCLM) for an application that demands high speed and frequent braking. Justify your choice. CO5 -App (20)